

### **Amendments to the Specification:**

Please amend the paragraph beginning on page 10, line 20 as follows:

Popova et al. (E. Popova, J. Faure-Vincent, C. Tiusan, et al., Appl. Phys. Lett. **81**, 1035 (2002)) have published results on epitaxial 100 oriented Fe/MgO/Fe/Co MTJs deposited by MBE on MgO(100) substrates. This group prepared the Fe layers by evaporation from a Knudsen cell and the Co and MgO layers by electron beam evaporation. The first Fe layer was deposited at room temperature and then annealed at 450 °C after deposition and prior to deposition of the MgO barrier. This group reported modest values of TMR at room temperature of only ~15% for junctions with 10 Å thick MgO barriers, although the crystalline quality of the structures was very good with smooth and epitaxial Fe and MgO layers. This same group has recently published data on similar structures with thicker tunnel barriers (25 Å thick) in which TMR values of up to 67% were found at room temperature (J. Faure-Vincent, C. Tiusan, E. Jouguelet, et al., Appl. Phys. Lett. **82**, 4507 (2003)). They argue that thick MgO tunnel barriers are needed to obtain these higher TMR values, even though the TMR they find is not significantly higher than that which has been observed in MTJs with Al<sub>2</sub>O<sub>3</sub> tunnel barriers. Popova et al. also suggest that the modest TMR values they find, especially when compared to the theoretical predictions of Butler et al., may result from the formation of an FeO layer at the Fe/MgO interface during the deposition of MgO on the lower Fe electrode. The formation of an FeO layer was previously postulated by Meyerheim et al. (H. L. Meyerheim, R. Popescu, J. Kirschner, et al., Phys. Rev. Lett. **87**, 076102 (2001)), who found evidence for a such a layer

from detailed structural investigations using surface x-ray diffraction of the growth of MgO on single crystal Fe(001) substrates. Recently, X.-G. Zhang, W. H. Butler, and A. Bandyopadhyay (Phys. Rev. B 68, 092402 (2003)) have carried out calculations of the TMR for Fe/FeO/MgO/Fe junctions and have found that the presence of an FeO layer substantially reduces the predicted TMR values for this system.

Please amend the paragraph beginning on page 18, line 3 as follows:

In another preferred embodiment, the overlayer and the underlayer include respective ferromagnetic materials that together with the MgO tunnel ~~junction~~ barrier form a magnetic tunnel junction, in which i) the amount of any oxide separating the MgO tunnel barrier from the ferromagnetic materials is sufficiently low, and ii) the MgO tunnel barrier, the underlayer, and the overlayer are sufficiently free of defects, that the room temperature tunnel magnetoresistance of the magnetic tunnel junction is greater than 70% (more preferably greater than 100%, and still more preferably greater than 160%). At least one of the underlayer and the overlayer may include antiferromagnetic material that is exchange biased with the ferromagnetic material of that layer, in which the antiferromagnetic material includes at least one alloy selected from the group consisting of Ir-Mn and Pt-Mn, with the alloy being substantially (100) oriented and fcc or slightly distorted fcc. The underlayer may include antiferromagnetic material over (e.g., in contact with) at least one layer selected from the group consisting of Ta and TaN.